<u>Attendance Problems</u>. Solve each proportion.

1. $\frac{6}{11}=\frac{8}{b}$ **2.** $\frac{5}{z}=\frac{z}{20}$ **3.** $\frac{3}{10}=\frac{6}{x+12}$

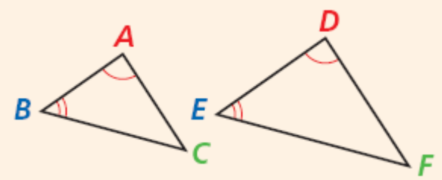
4. If $\Delta QRS \sim \Delta XYZ$, identify the pairs of congruent angles and write 3 proportions using pairs of corresponding sides.

- I can prove certain triangles are similar by using AA, SSS, and SAS.
- I can use triangle similarity to solve problems.

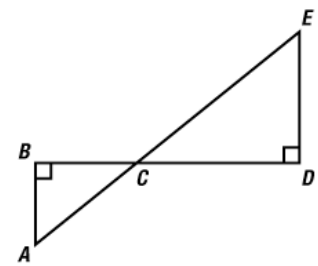
<u>Common Core</u>

CC.9-12.G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and prove relationships in geometric figures.
CC.9-12.G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
CC.9-12.G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar.

Postulate 7-3-1 Angle-Angle (AA) Similarity

POSTULATE	HYPOTHESIS	CONCLUSION
If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.		$\triangle ABC \sim \triangle DEF$

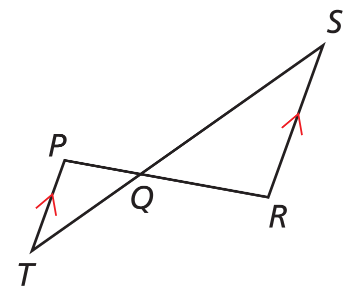
<u>Refer to video example 1.</u> Explain why the triangles are similar and write a similarity statement.



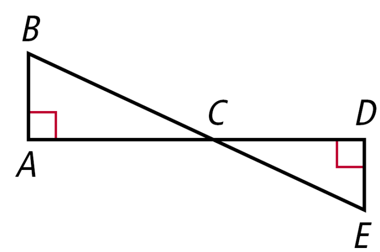
1 Using the AA Similarity Postulate

Explain why the triangles are similar and write a similarity statement.

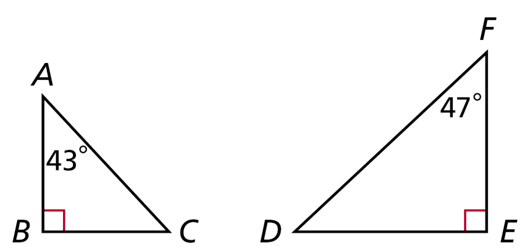
Since $\overline{PT} \parallel \overline{SR}$, $\angle P \cong \angle R$, and $\angle T \cong \angle S$ by the Alternate Interior Angles Theorem. Therefore $\triangle PQT \sim \triangle RQS$ by AA $\sim$.



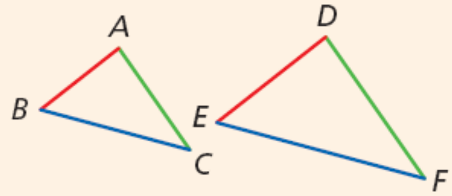
<u>Example 1</u>. Explain why the triangles are similar and write a similarity statement.



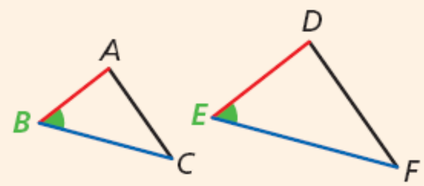
5. <u>Guided Practice</u>. Explain why the triangles are similar and write a similarity statement.



Theorem 7-3-2 Side-Side-Side (SSS) Similarity

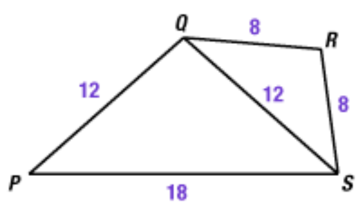
THEOREM	HYPOTHESIS	CONCLUSION
If the three sides of one triangle are proportional to the three corresponding sides of another triangle, then the triangles are similar.		$\triangle ABC \sim \triangle DEF$

Theorem 7-3-3 Side-Angle-Side (SAS) Similarity

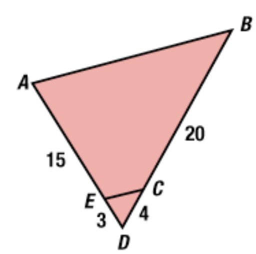
THEOREM	HYPOTHESIS	CONCLUSION
If two sides of one triangle are proportional to two sides of another triangle and their included angles are congruent, then the triangles are similar.	 $\angle B \cong \angle E$	$\triangle ABC \sim \triangle DEF$

Refer to example video example 2. Verify that the triangles are similar.

A.

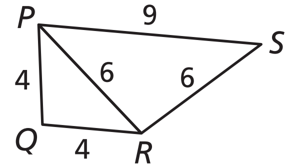


B.



2 Verifying Triangle Similarity

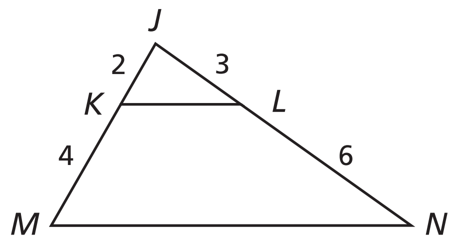
Verify that the triangles are similar.



A $\triangle PQR$ **and** $\triangle PRS$

$\frac{PQ}{PR} = \frac{4}{6} = \frac{2}{3}, \frac{QR}{RS} = \frac{4}{6} = \frac{2}{3}, \frac{PR}{PS} = \frac{6}{9} = \frac{2}{3}$

Therefore $\triangle PQR \sim \triangle PRS$ by SSS $\sim$.



B $\triangle JKL$ **and** $\triangle JMN$

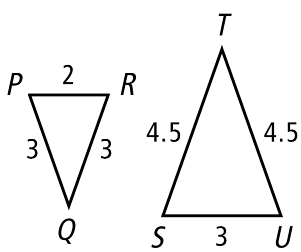
$\angle J \cong \angle J$ by the Reflexive Property of $\cong$.

$\frac{JK}{JM} = \frac{2}{6} = \frac{1}{3}, \frac{JL}{JN} = \frac{3}{9} = \frac{1}{3}$

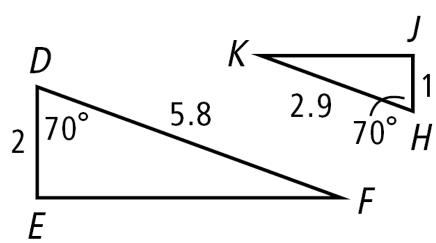
Therefore $\triangle JKL \sim \triangle JMN$ by SAS $\sim$.

<u>Example 2</u>. Verify that the triangles are similar.

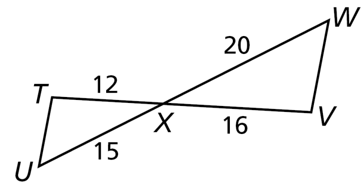
A.



B.

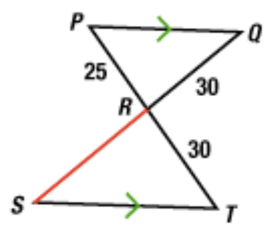


6. <u>Guided Practice</u>. Verify that $\Delta TXU \sim \Delta VXW$.



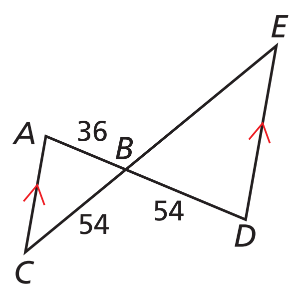
Refer to video example 3.

Explain why $\triangle PQR \sim \triangle TSR$ and then find SR.



3 Finding Lengths in Similar Triangles

Explain why $\triangle ABC \sim \triangle DBE$ and then find BE.



Step 1 Prove triangles are similar.

As shown $\overline{AC} \parallel \overline{ED}$, $\angle A \cong \angle D$, and $\angle C \cong \angle E$ by the Alternate Interior Angles Theorem. Therefore $\triangle ABC \sim \triangle DBE$ by AA $\sim$.

Step 2 Find BE.

$\frac{AB}{DB} = \frac{BC}{BE}$ — *Corr. sides are proportional.*

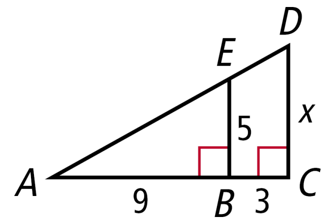
$\frac{36}{54} = \frac{54}{BE}$ — *Substitute 36 for AB, 54 for DB, and 54 for BC.*

$36(BE) = 54^2$ — *Cross Products Prop.*

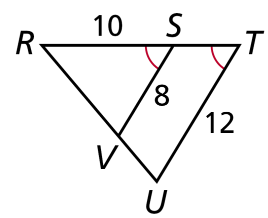
$36(BE) = 2916$ — *Simplify.*

$BE = 81$ — *Divide both sides by 36.*

<u>Example 3.</u> Explain why ΔABE ~ ΔACD, and then find CD.



7. <u>Guided Practice</u>. Explain why Δ*RSV* ~ Δ*RTU* and then find *RT*.



<u>7-3 Triangle Similarity: AA, SSS, & SAS</u> *(p 487)* 11-16.

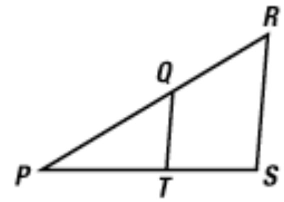
Q: What do you call a fierce beast?
A: A line

"If I am through learning, I am through."—*Basketball Coach, John Wooden*

<u>Refer to video example 4</u>.

Given:
Q is the midpoint of $\overline{PR}$.
T is the midpoint of $\overline{PS}$.

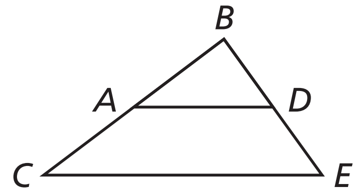
Prove: $\triangle PQT \sim \triangle PRS$



4 Writing Proofs with Similar Triangles

Given: A is the midpoint of $\overline{BC}$.
D is the midpoint of $\overline{BE}$.

Prove: $\triangle BDA \sim \triangle BEC$



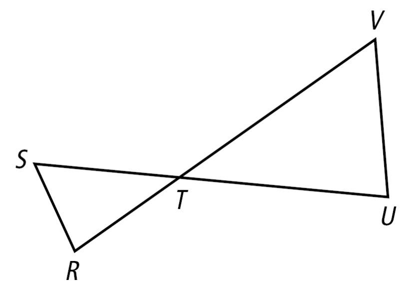
Proof:

Statements	Reasons
1. A is the mdpt. of $\overline{BC}$. D is the mdpt. of $\overline{BE}$.	**1.** Given
2. $\overline{BA} \cong \overline{AC}$, $\overline{BD} \cong \overline{DE}$	**2.** Def. of mdpt.
3. $BA = AC$, $BD = DE$	**3.** Def. of $\cong$ seg.
4. $BC = BA + AC$, $BE = BD + DE$	**4.** Seg. Add. Post.
5. $BC = BA + BA$, $BE = BD + BD$	**5.** Subst. Prop.
6. $BC = 2BA$, $BE = 2BD$	**6.** Simplify.
7. $\frac{BC}{BA} = 2$, $\frac{BE}{BD} = 2$	**7.** Div. Prop. of $=$
8. $\frac{BC}{BA} = \frac{BE}{BD}$	**8.** Trans. Prop. of $=$
9. $\angle B \cong \angle B$	**9.** Reflex. Prop. of $\cong$
10. $\triangle BDA \sim \triangle BEC$	**10.** SAS $\sim$ *Steps 8, 9*

Example 4.

Given: $3UT = 5RT$ and $3VT = 5ST$

Prove: $\Delta UVT \sim \Delta RST$



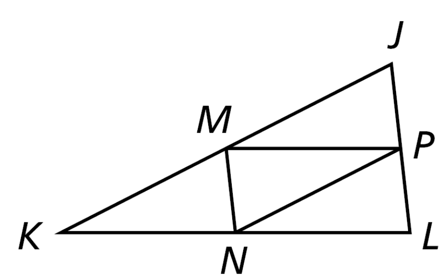
8. Guided Practice.

M is the midpoint of $\overline{JK}$.

Given: N is the midpoint of $\overline{KL}$.

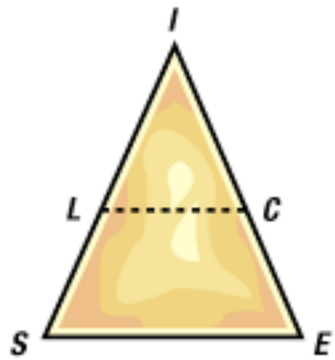
P is the midpoint of $\overline{JL}$.

Prove: $\Delta JKL \sim \Delta NPM$



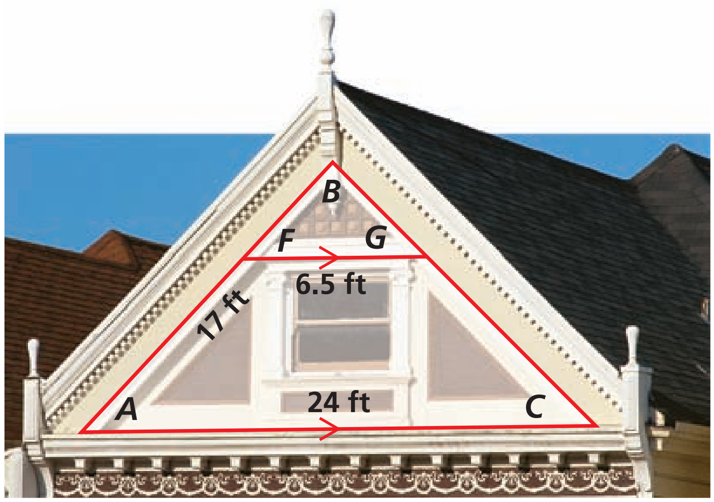
Refer to video example 5.

Here is a slice of cheese. $\overline{LC} \parallel \overline{SE}$, $SI = 10$ cm, $SE = 12$ cm, and $LC = 4.8$ cm. Use similar triangles to prove $\triangle SEI \sim \triangle LCI$, and then find LI.



5 *Engineering Application*

The photo shows a gable roof. $\overline{AC} \parallel \overline{FG}$. Use similar triangles to prove $\triangle ABC \sim \triangle FBG$ and then find BF to the nearest tenth of a foot.



Step 1 Prove the triangles are similar.

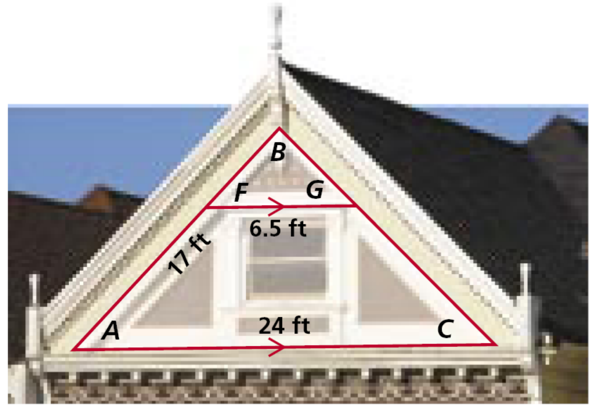
$\overline{AC} \parallel \overline{FG}$	*Given*
$\angle BFG \cong \angle BAC$	*Corr. ∠s Thm.*
$\angle B \cong \angle B$	*Reflex. Prop. of ≅*

Therefore $\triangle ABC \sim \triangle FBG$ by AA ~.

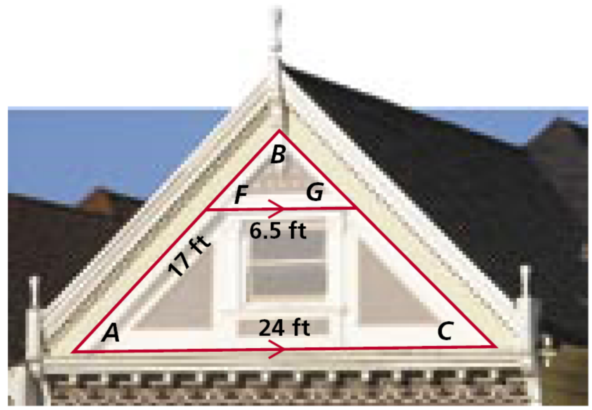
Step 2 Find BF.

$\frac{BA}{AC} = \frac{BF}{FG}$	*Corr. sides are proportional.*
$\frac{x+17}{24} = \frac{x}{6.5}$	*Substitute the given values.*
$6.5(x+17) = 24x$	*Cross Products Prop.*
$6.5x + 110.5 = 24x$	*Distrib. Prop.*
$110.5 = 17.5x$	*Subtract 6.5x from both sides.*
$6.3 \approx x$ or BF	*Divide both sides by 17.5.*

Example 5. The photo shows a gable roof. $AC \parallel FG$. $\Delta ABC \sim \Delta FBG$. Find BA to the nearest tenth of a foot.



9. <u>Guided Practice</u>. If $AB = 4x$, $AC = 5x$, and $BF = 4$, find FG.



Properties of Similarity

Reflexive Property of Similarity

$\triangle ABC \sim \triangle ABC$ (Reflex. Prop. of $\sim$)

Symmetric Property of Similarity

If $\triangle ABC \sim \triangle DEF$, then $\triangle DEF \sim \triangle ABC$. (Sym. Prop. of $\sim$)

Transitive Property of Similarity

If $\triangle ABC \sim \triangle DEF$ and $\triangle DEF \sim \triangle XYZ$, then $\triangle ABC \sim \triangle XYZ$. (Trans. Prop. of $\sim$)

<u>7-3 Triangle Similarity: AA, SSS, & SAS</u>

- *(p 487)* 11-19, 23, 26, 32.
- 7A Ready to Go On pretest & posttests.